

**TRANSLATION**

**PATENT COOPERATION TREATY**

**PCT**

**INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY**

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference <b>P36508-P0</b>	FOR FURTHER ACTION	See Form PCT/IPEA/416
International application No. <b>PCT/JP2004/018509</b>	International filing date (day/month/year) <b>10.12.2004</b>	Priority date (day/month/year) <b>22.01.2004</b>
International Patent Classification (IPC) or national classification and IPC <b>G02B6/12, G02B1/02</b>		
Applicant <b>MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.</b>		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of \_\_\_\_\_ sheets, including this cover sheet.

3. This report is also accompanied by ANNEXES, comprising:

a. ☐ (sent to the applicant and to the International Bureau) a total of \_\_\_\_\_ sheets, as follows:

☐ sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).

☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.

b. ☐ (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) \_\_\_\_\_, containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

<input checked="" type="checkbox"/>	Box No. I	Basis of the report
<input type="checkbox"/>	Box No. II	Priority
<input checked="" type="checkbox"/>	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
<input type="checkbox"/>	Box No. IV	Lack of unity of invention
<input checked="" type="checkbox"/>	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability: citations and explanations supporting such statement
<input checked="" type="checkbox"/>	Box No. VI	Certain documents cited
<input type="checkbox"/>	Box No. VII	Certain defects in the international application
<input type="checkbox"/>	Box No. VIII	Certain observations on the international application

Date of submission of the demand	Date of completion of this report
Name and mailing address of the IPEA/JP	Authorized officer
Facsimile No.	Telephone No.

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

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Box No. I	Basis of the report
1.	<p>With regard to the language, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.</p> <p><input type="checkbox"/> This report is based on translations from the original language into the following language _____ which is the language of a translation furnished for the purposes of:</p> <p><input type="checkbox"/> international search (Rule 12.3 and 23.1(b))</p> <p><input type="checkbox"/> publication of the international application (Rule 12.4)</p> <p><input type="checkbox"/> international preliminary examination (Rule 55.2 and/or 55.3)</p> <p>2. With regard to the elements of the international application, this report is based on <i>(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)</i>:</p> <p><input checked="" type="checkbox"/> the international application as originally filed/furnished</p> <p><input type="checkbox"/> the description:</p> <p>pages _____ as originally filed/furnished</p> <p>pages* _____ received by this Authority on _____</p> <p>pages* _____ received by this Authority on _____</p> <p><input type="checkbox"/> the claims:</p> <p>nos. _____ as originally filed/furnished</p> <p>nos.* _____ as amended (together with any statement) under Article 19</p> <p>nos.* _____ received by this Authority on _____</p> <p>nos.* _____ received by this Authority on _____</p> <p><input type="checkbox"/> the drawings:</p> <p>sheets _____ as originally filed/furnished</p> <p>sheets* _____ received by this Authority on _____</p> <p>sheets* _____ received by this Authority on _____</p> <p><input type="checkbox"/> a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.</p> <p>3. <input type="checkbox"/> The amendments have resulted in the cancellation of:</p> <p><input type="checkbox"/> the description, pages _____</p> <p><input type="checkbox"/> the claims, nos. _____</p> <p><input type="checkbox"/> the drawings, sheets/figs _____</p> <p><input type="checkbox"/> the sequence listing (<i>specify</i>): _____</p> <p><input type="checkbox"/> any table(s) related to sequence listing (<i>specify</i>): _____</p> <p>4. <input type="checkbox"/> This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).</p> <p><input type="checkbox"/> the description, pages _____</p> <p><input type="checkbox"/> the claims, nos. _____</p> <p><input type="checkbox"/> the drawings, sheets/figs _____</p> <p><input type="checkbox"/> the sequence listing (<i>specify</i>): _____</p> <p><input type="checkbox"/> any table(s) related to sequence listing (<i>specify</i>): _____</p>

\* If item 4 applies, some or all of those sheets may be marked "superseded."

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Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non obvious), or to be industrially applicable have not been examined in respect of:

☐ the entire international application

☒ claims Nos. 15

because:

☐ the said international application, or the said claims Nos. \_\_\_\_\_  
relate to the following subject matter which does not require an international preliminary examination (*specify*):

☒ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. 15  
are so unclear that no meaningful opinion could be formed (*specify*):

See Supplemental Box.

☐ the claims, or said claims Nos. \_\_\_\_\_ are so inadequately supported  
by the description that no meaningful opinion could be formed.

☐ no international search report has been established for said claims Nos. \_\_\_\_\_

☐ the nucleotide and/or amino acid sequence listing does not comply with the standard provided for in Annex C of the Administrative Instructions in that:

the written form

☐ has not been furnished

☐ does not comply with the standard

the computer readable form

☐ has not been furnished

☐ does not comply with the standard

☐ the tables related to the nucleotide and/or amino acid sequence listing, if in computer readable form only, do not comply with the technical requirements provided for in Annex C-bis of the Administrative Instructions.

☐ See Supplemental Box for further details.

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

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Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement			
1. Statement			
Novelty (N)	Claims	10-12, 14, 20-28	YES
	Claims	1-9, 13, 16-19	NO
Inventive step (IS)	Claims	14, 22-28	YES
	Claims	1-13, 16-21	NO
Industrial applicability (IA)	Claims	1-14, 16-28	YES
	Claims		NO
2. Citations and explanations (Rule 70.7)			
Document 1: JP 2003-240989 A (Matsushita Electric Industrial Co., Ltd.), 27 August 2003, [0143]; fig. 8 & US 2003/0180023 A1			
Document 2: JP 2002-365599 A (Agilent Technologies Inc.), 18 December 2002, paragraphs [0035]; fig. 9 & EP 1255136 A3 & US 2002/0159733 A1			
Document 3: Steven G. Johnson et al., Physical Review B, 1999, Vol. 60, No. 8, pages 5751-5758			
Document 4: Claude Weisbuch et al., IEICE Transaction on Electronics, 2001, Vol. E84-C, No. 5, pages 660-668			
Document 5: M.D.B. Charlton et al., Materials Science and Engineering B, 1997, Vol.49, No.2, pages 155 to 165			
Document 6: JP 2001-272566 A (Minolta Co., Ltd.), 5 October 2001 (25.10.01), paragraphs [0042] to [0043]; fig. 2, (Family: none)			
Document 7: JP 9-5549 A (Sumitomo Electric Industries, Ltd.), 10 January 1997 (10.01.97), paragraphs [0011]; fig. 1 (Family: none)			
Comments:			
Document 1 (paragraphs [0132] and [0143], [fig. 6],			

Box No. V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability;  
citations and explanations supporting such statement

[fig. 8]) discloses a device to which an incident/outgoing optical fibre is joined, said device being a two-dimensional photonic crystal waveguide wherein the cyclical arrangement of the holes changes at predetermined spots and the refractive index changes in a discontinuous manner in the direction of thickness.

Moreover, document 2 ([fig. 9] (a)), document 3, fig. 9(c), document 4 (fig. 14 (a), (c)) and document 5 (fig. 1(c)) disclose a two-dimensional photonic crystal waveguide, which is formed on a substrate and which has a refractive index that changes in a discontinuous manner in the direction of thickness.

Consequently, the feature set forth in claim 1 which indicates "the distribution of the refractive index gets progressively less the further it is from the optical axis" is included in the statement that the refractive index distribution changes in a discontinuous manner as is the case with the two-dimensional photonic crystal waveguide disclosed in documents 1-5. Furthermore, in said distribution of the refractive index, the refractive index changes in an infinitely steep manner and since the inventions in documents 1-5 are waveguides, it is clear that the parameters are determined in such a manner as to shut off the light in the direction of thickness.

Meanwhile, in the invention set forth in document 1, since the optical fibre and the thin-film core are connected in such a manner so as to share the joint surface, the radius of curvature of the light in the incident part of the thin-film core is substantially infinite and the beam spot diameter enters at the minimum level. In this case, the minimum level of the beam spot diameter is equivalent to having a beam waist state.

Box No. V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability;  
citations and explanations supporting such statement

Consequently, the inventions set forth in claims 1-9, 16 and 18 are identical to the inventions set forth in documents 1-5; the inventions set forth in claims 13, 19 and 20 are identical to the invention set forth in document 1; and the invention set forth in claim 17 is identical to the inventions set forth in documents 2-4.

It would not pose any difficulty to change the refractive index in a discontinuous manner in the two-dimensional photonic crystal waveguide disclosed in documents 1-5 in the manner described in document 6 ([0042]-[0043] and fig. 2).

Therefore, it would be easy for a person skilled in the art to conceive of the inventions set forth in claims 1-9, 13, 16-20 from the inventions disclosed in documents 1-6.

In the inventions set forth in documents 1-5, the feature of having sufficient film thickness so ensure that light is closed off within the waveguide is common technical knowledge. Therefore, making the beam spot radius  $\omega_1$  half that of the film thickness  $W$  would merely constitute a matter of design. Consequently, a person skilled in the art could derive the inventions set forth in claims 10 and 21 from the inventions disclosed in documents 1-5.

It would not be difficult to reduce the thickness of the waveguide locally in the lengthwise direction of the waveguide in order to allow for light to leak, as disclosed in document 7 (paragraph [0011]; fig. 1), in the inventions disclosed in documents 1-5. Therefore, a person skilled in the art could derive the inventions set

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Box No. V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability;  
citations and explanations supporting such statement

forth in claims 11 and 12 from the inventions disclosed  
in documents 1-5 and 7.

The inventions set forth in claims 14 and 22-28 are  
not disclosed in documents 1-7 and would not be obvious  
to a person skilled in the art.

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## Box No. VI Certain documents cited

## 1. Certain published documents (Rule 70.10)

Application No. Patent No.	Publication date (day/month/year)	Filing date (day/month/year)	Priority date (valid claim) (day/month/year)
JP 2004-86070 A	18.03.2004	28.08.2002	
[P, X, Y, A]			

## 2. Non-written disclosures (Rule 70.9)

Kind of non-written disclosure	Date of non-written disclosure (day/month/year)	Date of written disclosure referring to non-written disclosure (day/month/year)
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## Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of: III.

Claim 15 indicates "the predetermined spot" is the spot where the second member is substantially not arranged". Meanwhile, claim 13, which is recited in claim 15, indicates "the predetermined spot" is the spot at which the substantially cyclical arrangement of the second member alters." Therefore, there exists no "predetermined spot" that fulfils both requirements at the same time. Consequently, it is unclear which interpretation of the phrase "predetermined spot" for the invention in claim 15 is correct.